

NSW Innovation and Productivity Council

2018
2019

NSW Innovation and Productivity Scorecard

August 2019



Foreword

Welcome to the second NSW Innovation and Productivity Scorecard.

Mr. Neville Stevens AO

Chair, NSW Innovation and Productivity Council



It is my pleasure to release the second edition of the NSW Innovation and Productivity Scorecard, which outlines how NSW is tracking against comparable jurisdictions and world leading economies on a range of innovation and productivity metrics.

The Scorecard builds on the 2018 Scorecard, an important achievement for NSW and the first time an Australian state had produced a comprehensive review of its innovation and productivity performance.

The Innovation and Productivity Council (IPC) is proud to work with the NSW Government to grow the NSW economy, including by increasing innovation and productivity. To do this, we must understand where NSW is at, where our strengths and weaknesses are, how we compare to other jurisdictions, and how our performance is tracking over time. The annual IPC Scorecard provides an evidence base to give us this understanding, and to ensure decisions are based on robust data.

The 2019 Scorecard shows NSW has a strong economy, a highly educated and entrepreneurial workforce, and is the startup capital of Australia. The number of high growth businesses is increasing, which is a great result for NSW as growing businesses are critical for jobs growth and economic prosperity. More businesses are also using digital technologies which are associated with high growth.

While NSW has strong universities, university and industry collaboration remains a challenge. The IPC is currently undertaking research into ways to support collaboration between universities and small to medium enterprise (SME), and the translation of research and development (R&D) into commercial outcomes. This research will inform future policy making in this area.

The Scorecard will be published again in 2020. By this time, we will have collected and analysed data for the same metrics at three different points in time. This will enable even better insight into how NSW is tracking.

I hope you find the 2019 Scorecard a helpful resource.

I would like to thank my colleagues on the IPC as well as the IPC Secretariat for their contribution to this report.

Mr. Neville Stevens AO

Chair, NSW Innovation and Productivity Council

NSW Innovation and Productivity Scorecard

Better data informs better decisions

This report provides an important snapshot into how NSW is tracking on a range of innovation and productivity indicators.

It is produced by the Innovation and Productivity Council (IPC), comprised of highly respected industry, education and research leaders that advise the NSW Government on how to improve innovation and productivity in NSW.

Good data is the starting point for good advice and good decisions that will grow the NSW economy and enable citizens to prosper.

The Scorecard compares NSW's performance against key benchmark jurisdictions

Traditionally, innovation was measured at the national and international level using a range of businesses, university and government data on research, collaboration, skills and enterprise activity. While useful, key metrics were not available at a State level making it difficult to assess how NSW was performing.

The 2018 Scorecard changed this. It used traditional data sources and new metrics made available through advances in data science technology to develop complementary innovation metrics. It was a new approach that allowed us to drill deeper into the data to identify the story for NSW.

The Scorecard allows meaningful comparisons and the tracking of NSW's performance over time

The 2019 Scorecard reports on the same metrics as the 2018 Scorecard. By collecting data on these metrics annually, NSW will build a data bank to track NSW's performance over time. This will enable us to respond promptly to areas of weakness and celebrate areas of strength.

The report compares NSW's performance against a range of international jurisdictions and comparable Australian states, including Canada, Germany, New Zealand, Singapore, the United States, the United Kingdom, Australia and the Australian states of Victoria and Queensland. NSW is also compared with the OECD average and the US states of Georgia and California where such data exists.





Scorecard Highlights

Scorecard Year

○ 2018

● 2019



Research & Collaboration

NSW values research and development

\$11b

A total of \$11 billion was invested in R&D in NSW in 2018, equivalent to 1.9% of the State's GDP.

NSW researchers are producing quality work

4,236

In the last 10 years, NSW increased the number of papers in the top 1% most highly cited papers in the world to 4,236.

14%

One in seven (14.4%) researchers in NSW are in the global top 10 researchers in at least one specialised topic.



Three of NSW's 11 public universities rank in the global top 200, and six rank in the top 250.

University/industry collaboration is improving but remains a challenge



Almost one third (31.8%) of higher education research was funded by industry in 2017.



Skills & Enterprise

NSW has a highly educated workforce



Half (48.6%) of NSW workers are tertiary qualified, and almost all of these workers (96.9%) are employed.

NSW is the startup capital of Australia

49%

Half (49%) of all Australian startup founders are based in NSW.



Since the 2018 Scorecard, the rate of VC investment as a proportion of GDP in NSW has doubled.



More than 480 startups are now housed and collaborating in the NSW Government's Sydney Startup Hub.



NSW ranks 3rd behind California and Singapore for its number of startup founders.



NSW ranks 2nd for the proportion of businesses using digital 'growth technologies', behind California only.



Growth & Productivity

NSW has a strong economy and growing businesses



In 2017, NSW GDP grew by 2.6%.



NSW ranks 1st for the proportion of businesses that have increased their staff by >10% over a two year period.



In 2018, 3.9% more businesses were created in NSW.



NSW ranks 3rd behind Singapore and the US for labour productivity.

NSW energy productivity continues to improve



NSW ranks 4th for energy productivity behind Singapore, the UK and Germany.



Energy productivity has been steadily improving in NSW.

International Comparison



Research & Collaboration

Investments to generate knowledge and innovations



NSW invests in R&D and has good universities

NSW ranks well for business investment in R&D and performs above average for higher education investment in R&D.

NSW universities also perform well, although university-industry collaboration remains a challenge.

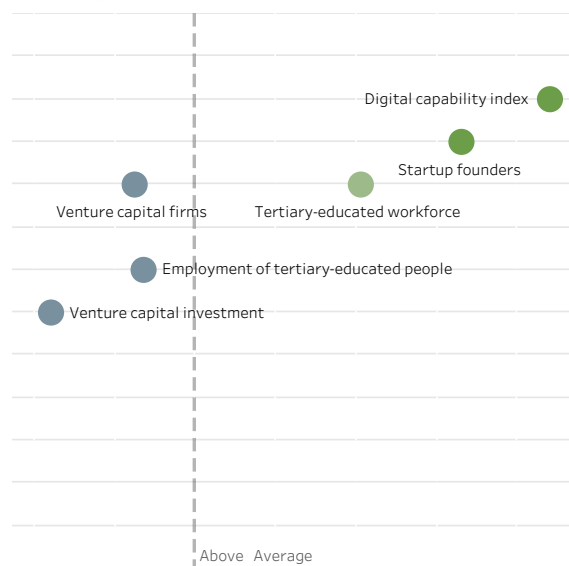
NSW researchers produce a high number of highly cited papers, but the number of researchers in NSW is comparatively low.

Government and not-for-profit R&D investment is relatively low, but this figure excludes R&D funds government provides to higher education or business.



Skills & Enterprise

Capacity to support innovations in the market



NSW has a highly-educated and entrepreneurial workforce

Almost half of all NSW workers are tertiary qualified.

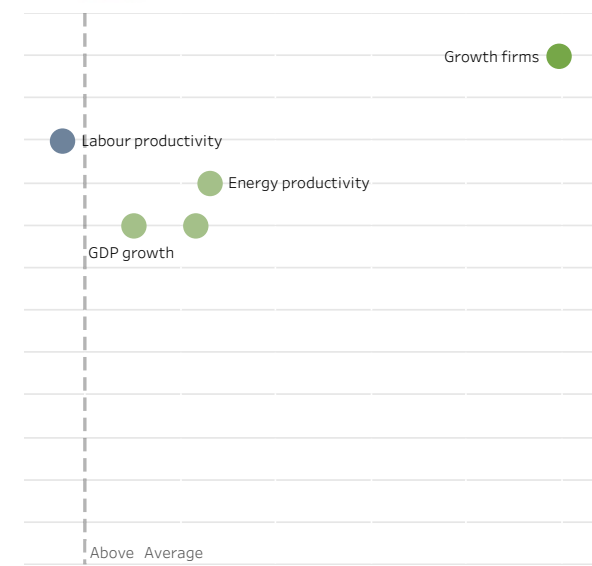
NSW also has a high proportion of startup founders, although lags leading jurisdictions on venture capital investment.

NSW ranks 2nd for digital capability, which measures use by businesses of digital technologies associated with a higher median headcount growth.



Growth & Productivity

Measures of economic performance and efficiency



NSW has a strong economy with growing businesses

NSW ranks 1st for the proportion of businesses that have grown by 10% over a two year period.

NSW performs above average for GDP growth, and ranks well for labour productivity which measures GDP per person employed.

Energy productivity in NSW is above average and has been steadily improving since 2010.

* This ranking compares NSW to the US, the UK, Canada, Singapore, Germany, New Zealand, the Australian average, the Australian states of Queensland and Victoria, and, where data are available, the US states of California and Georgia on a range of metrics. The y-axis shows where NSW ranks against those 11 comparison economies. The x-axis shows how close NSW's performance is to the average.



Current Performance & Recent Trends

LEGEND

Current performance

- NSW performs above average
- NSW performs at average
- NSW performs below average

NSW five year trend

- ↗ Upward trend
- ↘ Downward trend
- No trend data



Research & Collaboration

NSW COMPARED TO INTERNATIONAL AND STATE BENCHMARKS

●	Business investment in R&D	↘
●	Government and not-for-profit investment in R&D	↘
●	Higher education investment in R&D	↘
●	Total investment in R&D	—
●	Number of researchers	—
●	Top 1% cited papers	—
●	Researchers who are top 10 in their field	—
●	Top 200 universities	↘
●	University and industry collaboration index	—
●	Patent applications	↗

NSW COMPARED TO AUSTRALIA AND STATE BENCHMARKS ONLY

●	Government and not-for-profit investment in R&D	↘
●	Higher education research funded by industry	↗
●	Australian Research Council linkage project grants	—
●	Patent applicants	↘
●	Trademark applicants	↘
●	Invention disclosures	↘



Skills & Enterprise

NSW COMPARED TO INTERNATIONAL AND STATE BENCHMARKS

●	Number of venture capital firms	—
●	Venture capital investment	↗
●	Number of startup founders	—
●	Digital capability index	—
●	Tertiary-educated workforce	↗
●	Employment of tertiary-qualified people	↘

NSW COMPARED TO AUSTRALIA AND STATE BENCHMARKS ONLY

●	Startups from research institutions	—
●	Australian startup founders	—
●	Commercialisation staff in universities	↗
●	Vocationally trained workforce	↗



Growth & Productivity

NSW COMPARED TO INTERNATIONAL AND STATE BENCHMARKS

●	Labour productivity	↗
●	Growth firms	—
●	Annual GDP growth	↗
●	Energy productivity	↗
●	Energy productivity improvement	↗

NSW COMPARED TO AUSTRALIA AND STATE BENCHMARKS ONLY

●	Net business creation	↗
●	Multi-factor productivity	↗

International and State Benchmarks

Scorecard Legend

■ NSW
 ■ Australia
 ■ Nations
 ■ States
 ■ OECD average

Scorecard Year

○ 2018

● 2019

These figures are in US Dollars. The calculations in the Scorecard are based on USD PPP. Purchasing Power Parity (PPP) compares different countries' currencies through a market "basket of goods" approach. Two currencies are in PPP when a market basket of goods (taking into account the exchange rate) is priced the same in both countries.

CANADA

GDP 2018: \$1,707 B 4.4 x NSW GDP¹

Population 2017: 36.7M

Majority service industries. Strong primary sector – forestry, petroleum and agriculture. Sizeable manufacturing sector.

Global Innovation Index rank 2018: 18

Human Development Index rank 2018: 12

Environmental Performance Index rank 2018: 25

UNITED STATES

GDP 2018: \$19,485 B 49.9 x NSW GDP¹

Population 2017: 326.0M

Diverse economy with abundant natural resources and well developed infrastructure. Ranks second in the world for highest estimates value of natural resources.

Global Innovation Index rank 2018: 6

Human Development Index rank 2018: 13

Environmental Performance Index rank 2018: 27

CALIFORNIA

GDP 2018: \$2,810 B 7.2 x NSW GDP³

Population 2017: 39.4M

Diverse economy, known for technology, entertainment and agriculture. Largest economy in the United States.

GEORGIA

GDP 2018: \$562 B 1.4 x NSW GDP³

Population 2017: 10.4M

Majority service industries. Significant manufacturing – textiles, pulp and paper products. Sizeable agricultural sector

UNITED KINGDOM

GDP 2018: \$2,966 B 7.6 x NSW GDP¹

Population 2017: 66.0M

Majority service industries. Strong financial services industry. Significant defence, aerospace and pharmaceutical sectors.

Global Innovation Index rank 2018: 4

Human Development Index rank 2018: 14

Environmental Performance Index rank 2018: 6

GERMANY

GDP 2018: \$4,346B 11.1 x NSW GDP¹

Population 2017: 82.7M

Majority services and IT industries. Strong manufacturing sector – vehicles, machinery, chemical goods, electronic products, equipment, pharmaceuticals. Third largest exporter in the world.

Global Innovation Index rank 2018: 9

Human Development Index rank 2018: 5

Environmental Performance Index rank 2018: 13



OECD

The Organisation for Economic Co-operation and Development (OECD) is an association of 35 developed nations founded 'to promote policies that will improve the economic and social well-being of people around the world'.

SINGAPORE

GDP 2018: \$542 B 1.4 x NSW GDP¹

Population 2017: 5.6M

Regional hub for financial services. Significant exports in electronics and chemicals. Dependent on imports of natural resources.

Global Innovation Index rank 2018: 5

Human Development Index rank 2018: 9

Environmental Performance Index rank 2018: 49

AUSTRALIA

GDP 2018: \$1,222 B 3.1 x NSW GDP¹

Population 2017: 24.6M

Majority service industries. Second wealthiest nation (wealth per adult). Eighth highest globally for total estimated value of natural resources.

Global Innovation Index rank 2018: 20

Human Development Index rank 2018: 3

Environmental Performance Index rank 2018: 21

QUEENSLAND

GDP 2018: \$222 B 0.6 x NSW GDP²

Population 2017: 4.9M

Strong mining, agriculture, tourism and financial services. Main exports are coal, metals, meat and sugar.

NEW SOUTH WALES

GDP 2018: \$391 B 1 x NSW GDP²

Population 2017: 7.9M

NSW is Australia's largest economy. It has a diverse range of industries and is highly competitive in the financial services, education and tourism sectors. It also has a strong primary sector, with high exports of both agricultural products and mineral resources.

VICTORIA

GDP 2018: \$277 B 0.7 x NSW GDP²

Population 2017: 6.3M

Finance and insurance sectors produce most income. Health care and social assistance employ the most people.

Second largest economy in Australia

NEW ZEALAND

GDP 2018: \$194 B 0.5 x NSW GDP¹

Population 2017: 4.8M

Majority service sector. Large scale manufacturing industries – aluminum, food processing, metal fabrication, wood and paper.

Global Innovation Index rank 2018: 22

Human Development Index rank 2018: 16

Environmental Performance Index rank 2018: 17



R&D Investment

Research and development expenditure is the money spent on creative work undertaken on a systematic basis to increase the stock of knowledge and the use of this knowledge to devise new applications

NSW ranks 5th for overall investment in research and development (R&D), with 1.9% of NSW GDP spent on R&D.

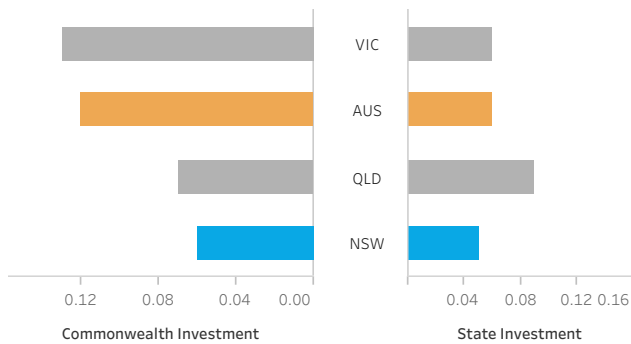
Most R&D investment in NSW comes from business. No new data on business R&D investment has been released since the 2018 Scorecard, but the data available shows NSW ranks 4th for business investment in R&D outperforming all Australian benchmarks.

NSW outperforms most international benchmarks for higher education R&D investment, but lags Australian benchmarks on this metric. It also lags Australian states in Commonwealth R&D investment, presenting an opportunity for NSW to secure more of this investment.

Government and not-for-profit R&D measures spending within government departments and not-for-profit organisations. It does not include R&D funds government provides to higher education or the private sector. While NSW is outperformed by most benchmarks on this metric, i..

GOVERNMENT & NOT-FOR-PROFIT R&D IN AUSTRALIA

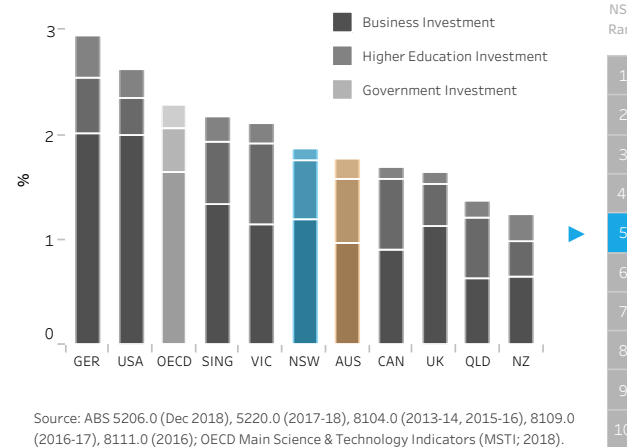
Australian and state government and non-profit organisations expenditure in R&D as a percentage of GDP, 2016-17



Source: ABS 5206.0 (Dec 2018), 5220.0 (2017-18), 8109.0 (2016-17).
Different time periods have been used to reflect the latest available data

TOTAL R&D INVESTMENT

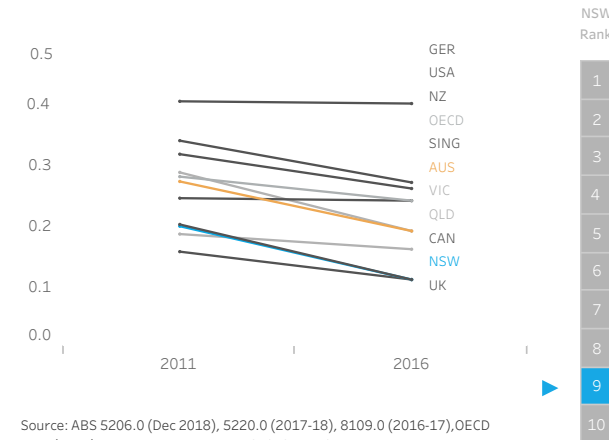
Gross investment in R&D as a percentage of GDP, 2014



Source: ABS 5206.0 (Dec 2018), 5220.0 (2017-18), 8104.0 (2013-14, 2015-16), 8109.0 (2016-17), 8111.0 (2016); OECD Main Science & Technology Indicators (MSTI; 2018). Time series data has not been calculated. OECD average is not included in rankings.

GOVERNMENT & NOT-FOR-PROFIT R&D

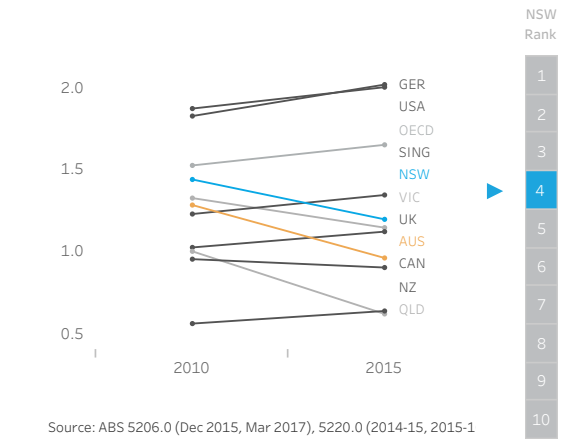
Other government and non-profit organisation expenditure in R&D as a percentage of GDP, 2011-2016



Source: ABS 5206.0 (Dec 2018), 5220.0 (2017-18), 8109.0 (2016-17), OECD MSTI (2018). OECD average is not included in rankings.

BUSINESS R&D

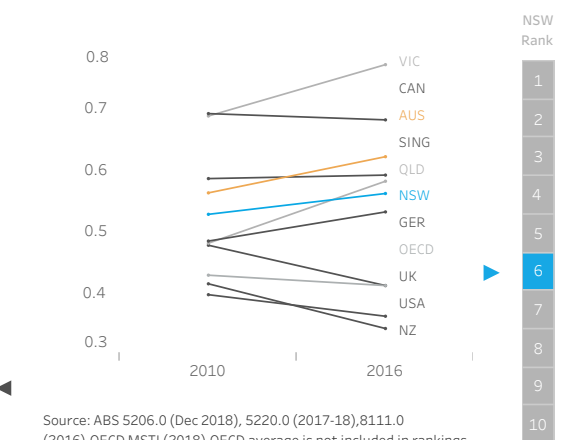
Business investment in R&D as a percentage of GDP, 2010-2015



Source: ABS 5206.0 (Dec 2015, Mar 2017), 5220.0 (2014-15, 2015-16), 8104.0 (2013-14, 2015-16); OECD MSTI, 2017. OECD average is not included in rankings

HIGHER EDUCATION R&D

Higher education investment in R&D as a percentage of GDP, 2010-2016



Source: ABS 5206.0 (Dec 2018), 5220.0 (2017-18), 8111.0 (2016), OECD MSTI (2018). OECD average is not included in rankings.



Research Workforce

While NSW has fewer researchers per 1,000 workers than most benchmarks, it has top researchers producing quality work.

NSW researchers produced 4,236 top 1% cited papers over a 10 year period, outperforming most international benchmarks.

Around one in seven (14.4%) NSW researchers are in the top 10 in their field, as ranked by the League of Scholars which rates scholars on citations, industry collaboration and public engagement. NSW performance on this metric is comparable to other Australian jurisdictions, but lags behind US benchmarks, the UK and Canada.

The number of top papers and top researchers in NSW has increased since the 2018 Scorecard, which is good news for NSW.

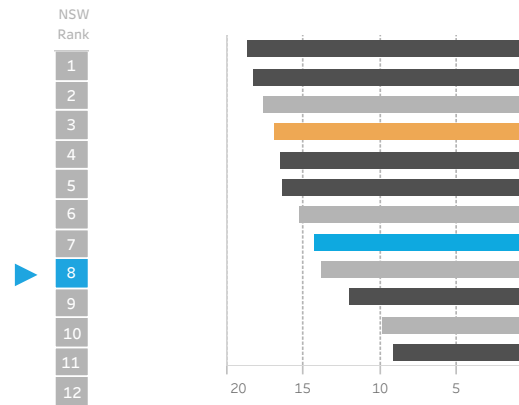
NSW universities also perform well. NSW ranks 3rd for the number of top 200 universities per million population. Of the 11 public universities in NSW, three are ranked in the top 200 of the QS World University Rankings and six are ranked in the top 250.

NSW universities are ranked number one for research in over 50 diverse topics, including field robotics, information systems, social marketing, physiotherapy and molecular ecology ⁵



RESEARCHERS

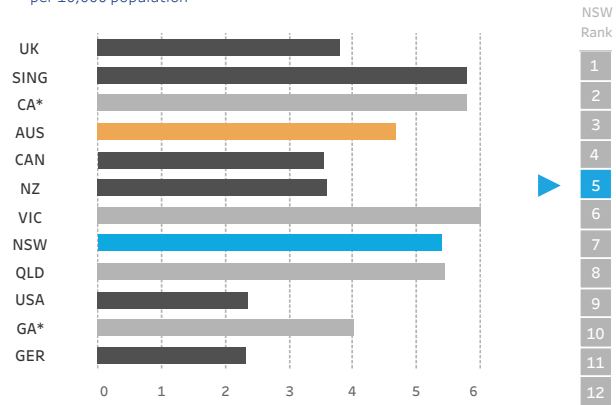
Number of researchers per 1,000 workers, 2018



Source: CSIRO Data61 Ribit.net analysis of LinkedIn data (2018); OECD MSTI, 2018
Time series data has not been calculated.
*The US State of California and Georgia.

TOP PAPERS

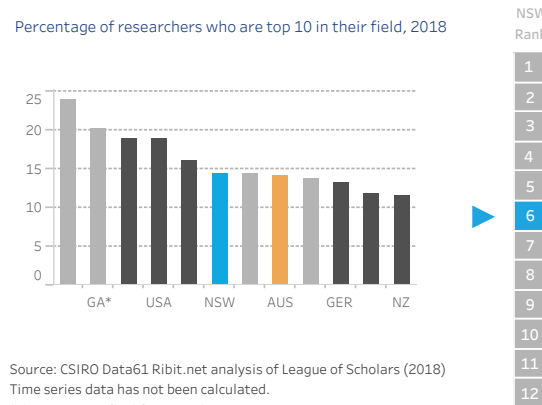
Number of top 1% cited papers over 10 years to 2018 per 10,000 population



Source: InCites (2006-2018); ABS 3101.0 (Mar 2018); OECD MSTI (2018); US Census Bureau (2018) Time series data has not been calculated.
*The US State of California and Georgia.

TOP RESEARCHERS

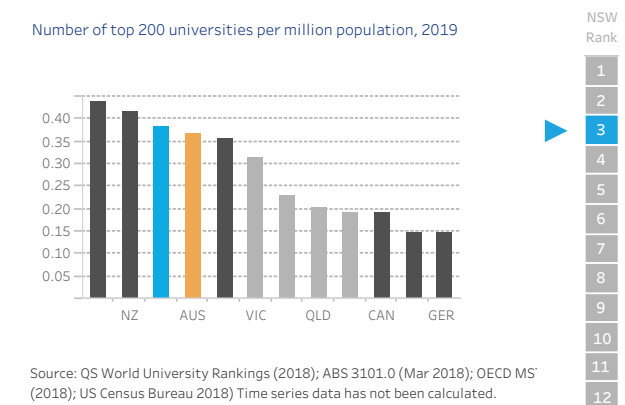
Percentage of researchers who are top 10 in their field, 2018



Source: CSIRO Data61 Ribit.net analysis of League of Scholars (2018)
Time series data has not been calculated.
*The US State of California and Georgia.

TOP UNIVERSITIES

Number of top 200 universities per million population, 2019



Source: QS World University Rankings (2018); ABS 3101.0 (Mar 2018); OECD MSTI (2018); US Census Bureau 2018) Time series data has not been calculated.
*The US State of California and Georgia.



Collaboration

Greater collaboration between the research and innovation sector and industry is critical if the research and innovation taking place in Australia are to yield commercial outcomes ⁶.

All jurisdictions outperform NSW for university and industry collaboration, although NSW's performance on this metric is comparable to other Australian benchmarks. This metric is measured by the Netherlands' Leiden University by looking at the number and proportion of a university's publications that have been co-authored with private-sector for profit enterprises.

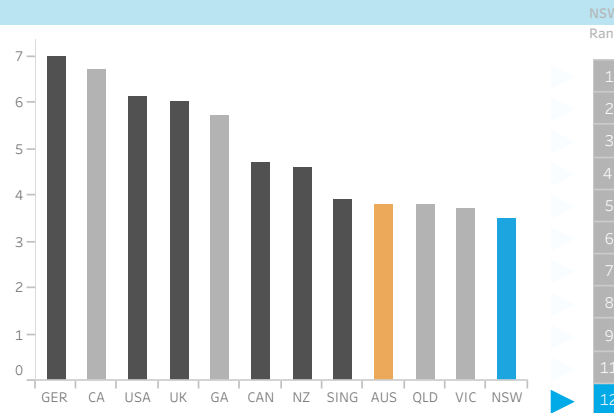
Leiden University's findings are supported by the 2018 Global Innovation Index (GII) which ranked Australia 32 for university and industry research collaboration, well below Australia's overall GI ranking of 20.

While university and industry collaboration remains a challenge, the percentage of higher education research funded by industry has increased. In 2017, almost one third (31.8%) of NSW higher education research was funded by industry.

The Australian Research Council (ARC) provides Linkage Project grants for collaborative research partnerships. While the dollar value of grants NSW attracts per researcher has increased since the 2018 Scorecard, Queensland now outperforms NSW on this metric, whereas in the 2018 Scorecard NSW marginally outperformed all Australian benchmarks.

UNIVERSITY AND INDUSTRY COLLABORATION

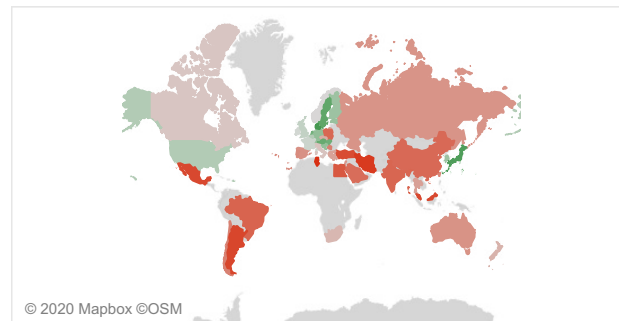
CWTS Leiden Ranking University-Industry Collaboration score, 2018



Source: CSIRO Data61 Ribit.net analysis of CWTS Leiden Ranking University-Industry Collaboration data (2018) (average across all universities in a jurisdiction) Time series data has not been calculated. *The US State of California and Georgia.

UNIVERSITY AND INDUSTRY COLLABORATION

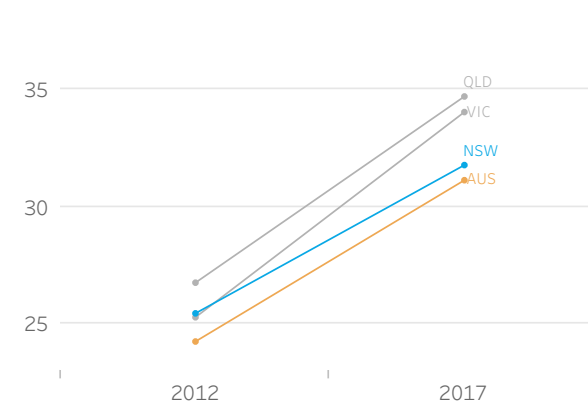
World heat map of highest (green) and lowest (red) collaboration, 2018



Source: CSIRO Data61 Ribit.net analysis of CWTS Leiden Ranking University-Industry Collaboration data (2018).

HIGHER EDUCATION RESEARCH FUNDED BY INDUSTRY

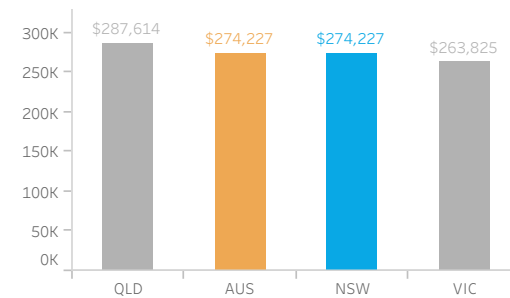
Percentage of higher education research funded by industry, 2012-2017



Source: Department of Education and Training (DET) Higher Education Research Data Collection (HERDC), Research Income (1994-2017).

RESEARCH GRANTS

Australian Research Council (ARC) Linkage Project funding per researcher, 2018



Source: CSIRO Data61 Ribit.net analysis of Australian Research Council data, DET, (2018).



Ideas & Inventions

A patent is used to protect new inventions and gives the patent recipient the right to commercially exploit their invention for the life of the patent. A trademark is used to distinguish goods and services from those of another business.⁷ While patent and trademark application rates can indicate trends in innovation, caution is needed when using them as a comparative measure of innovation as they are dependent on economic composition and industry structure.

No new data on patent and trademark applications in NSW has been released since the 2018 Scorecard. The data available shows the rate of patent applications in NSW is higher than other Australian benchmarks and comparable to the UK and Canada, but is significantly lower than Germany, the US and Singapore. This may be because the majority of Australia's traded good are either services or commodities which do not correlate to high levels of patenting.

The rate of patent applicants has decreased in all Australian states in recent years, while the rate of trademark applicants has remained more steady.

An invention disclosure is a confidential description of an invention that is potentially patentable or may have commercial value. The NSW invention disclosure rate has increased slightly since the 2018 Scorecard, but is still lower than the rate for other Australian benchmarks.

PATENT APPLICATIONS

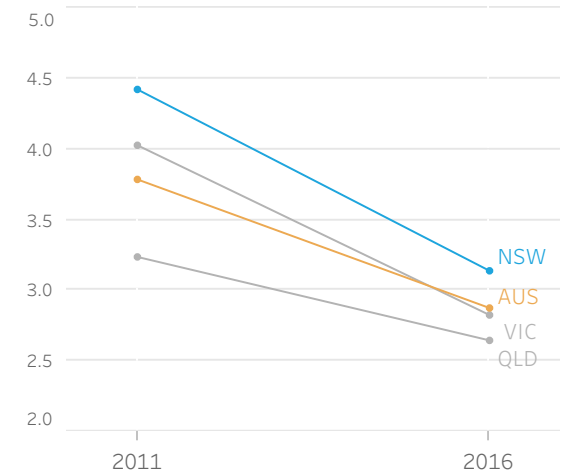
Patent applications per 10,000 population, 2016



Source: ABS 3101.0 (Sep 2018); IP Australia (2017); OECD MSTI (2018) Time series data has not been calculated. OECD average is not included in rankings.

PATENT APPLICANTS

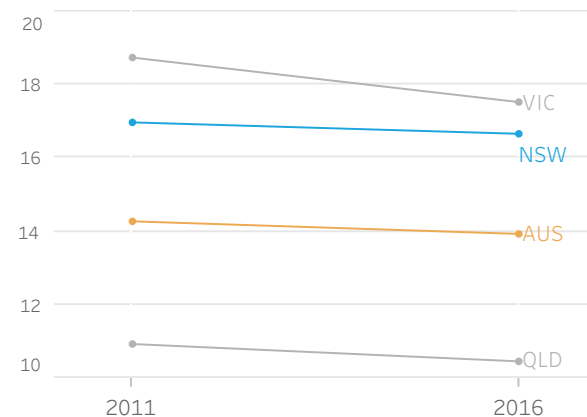
Patent applicants per 10,000 population, 2011-16



Source: ABS 3101.0 (Mar 2017); Office of Chief Economist, Innovation Map, accessed 5 December 2017

TRADEMARK APPLICANTS

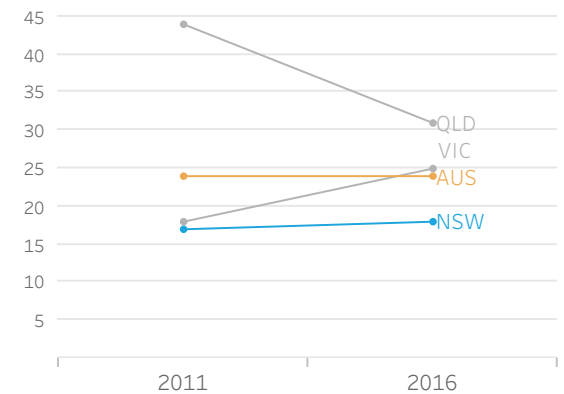
Trademark applicants per 10,000 population, 2011-2016



Source: ABS 3101.0 (Mar 2017); Office of Chief Economist, Innovation Map, accessed 5 December 2017.

INVENTION DISCLOSURES

Invention disclosures per institute, 2011-2016



Source: Department of Industry, Innovation & Science, National Survey of Research Commercialisation 2000-2016 (NSRC).

PATENT

In 2016, there were **2,429 PATENT APPLICANTS** and **12,898 TRADEMARK APPLICANTS** from NSW[®]



Venture Capital & Startups

Over the last few years, the Australian innovation landscape has changed dramatically — start-ups, incubators, and accelerators have emerged across the country. Savvy investors are increasingly seeing the commercial value of new technologies buoyed by the success of local companies like Atlassian, Canva and Hatchtech⁸

NSW is the startup capital of Australia. It is estimated that almost half (49%) of all startup founders in Australia are located in NSW, well ahead of Queensland at 20% and Victoria at 13%. NSW also has more venture capital firms and receives more venture capital investment as a percentage of GDP than the Australian benchmarks.

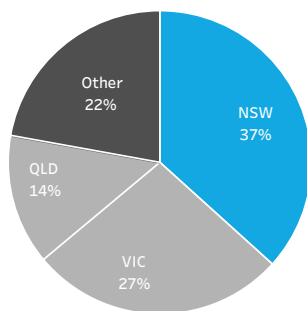
NSW still lags most international benchmarks on venture capital investment. However, since the 2018 Scorecard, the rate of NSW VC investment as a proportion of GDP has doubled, albeit from a low base.

In 2017, NSW invested heavily in startups by establishing the Sydney Startup Hub to support collaboration, attract investors and strengthen the startup community. The Hub houses more than 480 startups, leading incubator and coworking communities, and large corporate accelerators.⁹ In the 2019 Global Startup Ecosystem Report, NSW ranked in the top 10 for global and local connectedness, well above its overall ranking of 23.

NSW ranks 3rd for the proportion of people on social media identifying as st..

STARTUPS FROM RESEARCH INSTITUTIONS

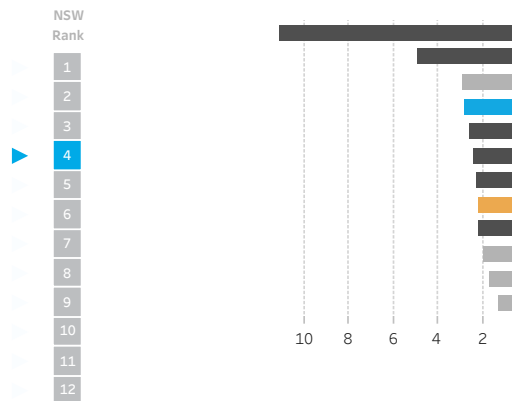
Location of startups arising from universities and research institutions, 2011-2016



Source: Department of Industry, Innovation & Science, NSRC (2000-2016).

VENTURE CAPITAL FIRMS

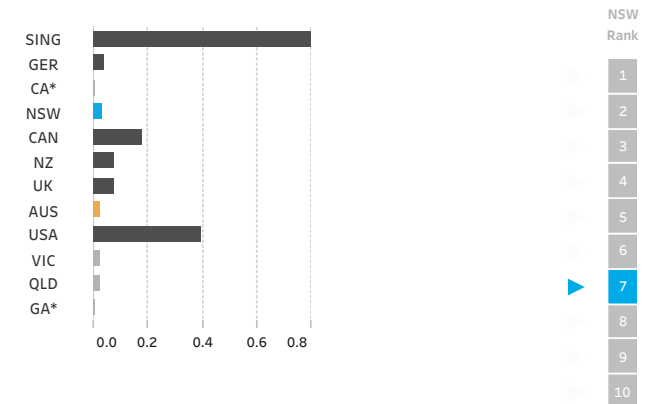
Venture capital firms per 1,000 firms on social media, 2018



Source: CSIRO Data61 Ribit.net analysis of LinkedIn data (2018) Time series data has not been calculated. *The US State of California and Georgia.

VENTURE CAPITAL INVESTMENT

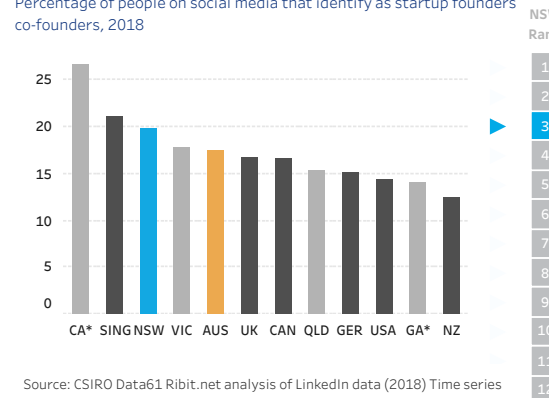
Venture capital as a percentage of GDP, 2018



Source: OECD, Entrepreneurship at a glance (2017); OECD MSTI (2018); ABS 5206.0 (Dec 2018), 5220.0 (2017-18), 5678.0 (2016-17); Duff & Phelps, Transaction Trail (2018) Time series data has not been calculated. *The US State of California and Georgia.

STARTUP FOUNDERS

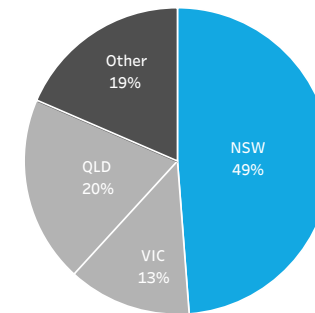
Percentage of people on social media that identify as startup founders co-founders, 2018



Source: CSIRO Data61 Ribit.net analysis of LinkedIn data (2018) Time series data has not been calculated. *The US State of California and Georgia.

AUSTRALIAN STARTUP FOUNDERS

Location of startup founders, 2018



Source: Startup Muster Annual Report (2018).



Digital Capability

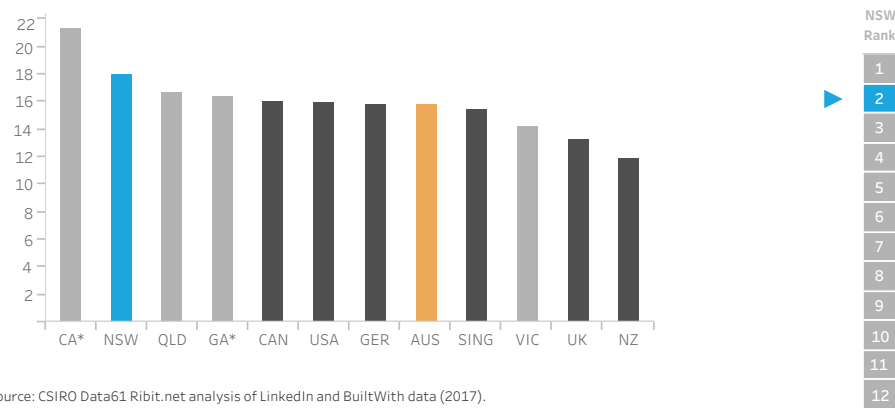
Digital Capability is a measure of how widely businesses are using leading digital technologies that are associated with high growth.

Research undertaken by CSIRO Data61 for the 2018 Scorecard showed that the median headcount growth for companies that use certain digital technologies was 8% higher than for companies that do not use these technologies. The digital technologies assessed include cloud productivity apps, search engine optimisation tools and services, and websites that are designed for mobile usage as well as desktop.

NSW ranks 2nd for digital capability behind California only, with almost one in five (17.9%) NSW businesses on LinkedIn using these technologies. NSW performance on this metric has significantly improved since the 2018 Scorecard.

DIGITAL CAPABILITY

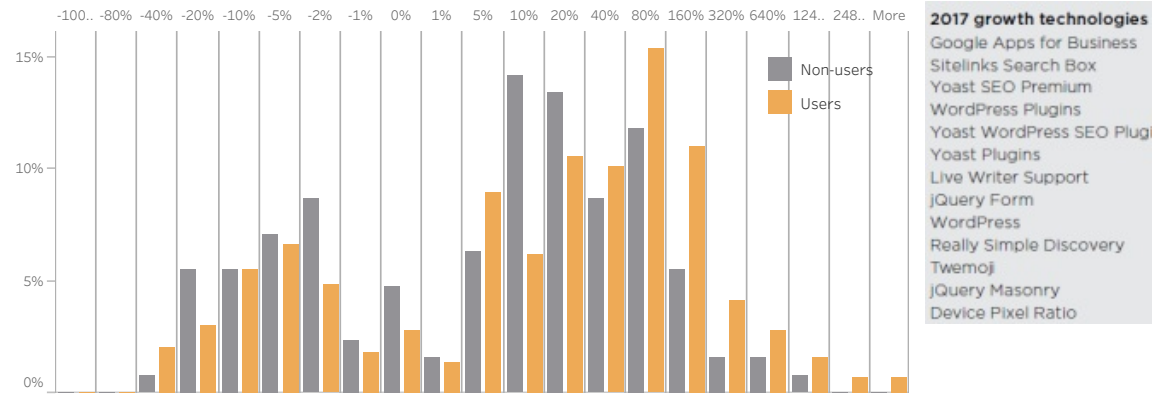
Percentage of businesses using technologies that are correlated with growth, 2016-2018



Source: CSIRO Data61 Ribit.net analysis of LinkedIn and BuiltWith data (2017).

GROWTH TECHNOLOGIES

Distribution of employment growth and users and non-users of growth technologies, 2015-2017



Source: CSIRO Data61 Ribit.net analysis of LinkedIn and BuiltWith data (2017).

- 2017 growth technologies**
- Google Apps for Business
 - Sitelinks Search Box
 - Yoast SEO Premium
 - WordPress Plugins
 - Yoast WordPress SEO Plugin
 - Yoast Plugins
 - Live Writer Support
 - jQuery Form
 - WordPress
 - Really Simple Discovery
 - Twemoji
 - jQuery Masonry
 - Device Pixel Ratio

Since the 2018 Scorecard, there has been a **42% INCREASE** in the proportion of NSW businesses **USING DIGITAL 'GROWTH TECHNOLOGIES'**

Skilled Workforce

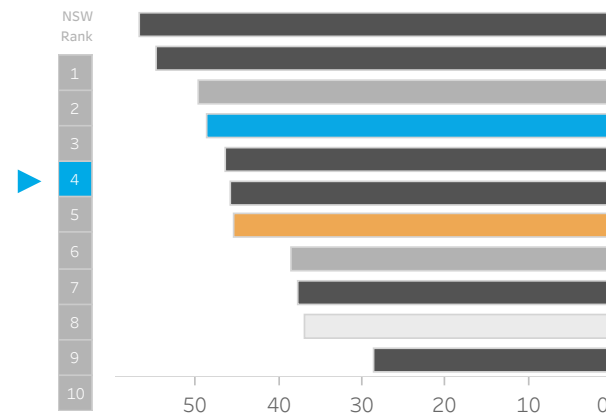
NSW has a highly educated workforce, with almost half (48.6%) of NSW workers tertiary-qualified. NSW ranks 4th for the proportion of tertiary qualified workers, behind Canada, Singapore and Victoria only. The employment rate of these workers is very high (96.9%) and comparable to other benchmark jurisdictions.

NSW's proportion of VET qualified workers is on par with Victoria, but lower than Queensland, and may be connected to the higher rates of tertiary-qualified workers in NSW and Victoria. Almost one in five (18.8%) NSW workers have a VET qualification.

NSW attracts the highest rate of managers and professionals on Australian skilled worker visas. It is also home to one quarter (25%) of all research commercialisation full-time employees working in universities.

TERTIARY-QUALIFIED WORKFORCE

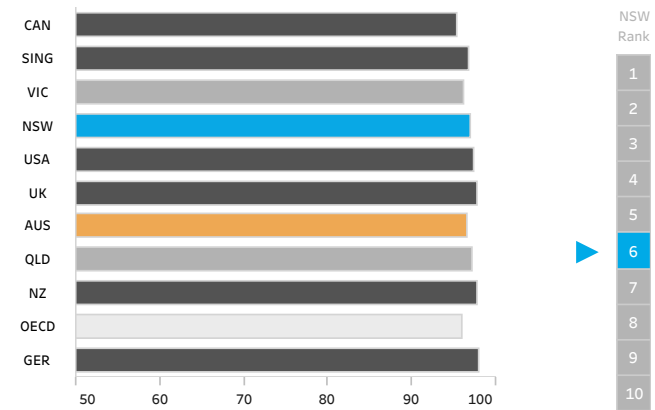
Percentage of labour force with tertiary qualifications, 2017



Source: ABS 6291.0 (Nov 2018); OECD Education at a glance (2017, 2016); Singapore Ministry of Manpower (2018) Time series data has not been calculated. OECD average is not included in rankings

EMPLOYMENT OF TERTIARY-QUALIFIED PEOPLE

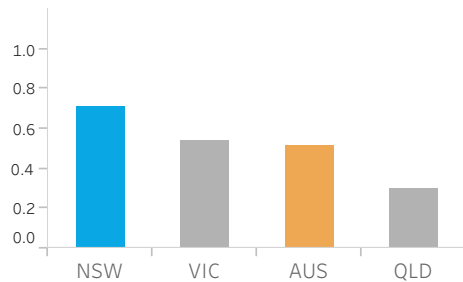
Percentage of tertiary qualified people in the labour force who are employed, 2017



Source: ABS 6291.0 (Nov 2018); OECD Education at a glance (2017, 2016), Singapore Ministry of Manpower (2018) Time series data has not been calculated. OECD average is not included in rankings

SKILLED WORKER VISAS

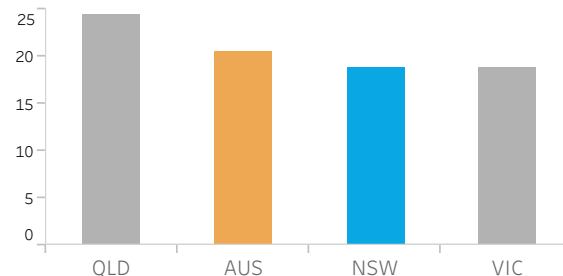
Percentage of managers and professionals employed on subclass 457 & 482 visas, 2018



Source: Department of Immigration & Border Protection Temporary Work (Skilled) visas granted 2018-12-31; ABS 6291.0 (1986 onwards).

VOCATIONALLY TRAINED WORKFORCE

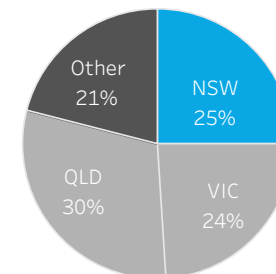
Percentage of labour force with vocational education and training qualifications (up to Certificate IV), 2017



Source: ABS 6291.0 (Nov 2018).

COMMERCIALISATION SKILLS

Dedicated research commercialisation full time employees (FTE) in universities, 2016



Source: Department of Industry, Innovation & Science NSRC (2000-2016).

Economic Performance

NSW has a strong economy. GDP growth was 2.6% in 2017 which is on par with the five-year average.

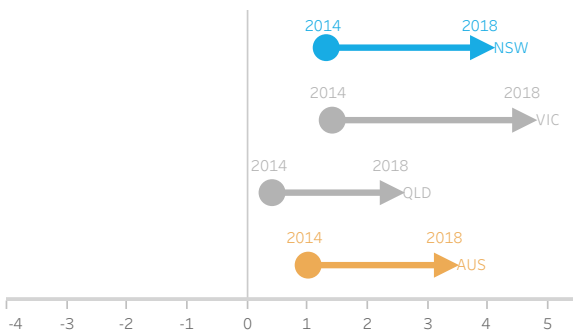
NSW ranks 1st for the proportion of businesses that have grown their employee headcount by more than 10% per annum over a two year period, an improvement from the 2018 Scorecard which ranked NSW 3rd for this metric. It also ranks 3rd for labour productivity, which measures GDP per person employed.

NSW created 3.9% more businesses in 2018 compared to 1.3% more businesses in 2014, ahead of Queensland but behind Victoria.

No new data on multi-factor productivity (MFP) has been released since the 2018 Scorecard, but the most recent data shows NSW outperforming all Australian benchmarks. MFP growth is essentially the part of GDP growth that cannot be explained by changes in labour and capital inputs.¹¹ Research has shown that innovation, and an organisation's ability to absorb and utilise new knowledge, is a key driver of economy-wide MFP.

NET BUSINESS CREATION

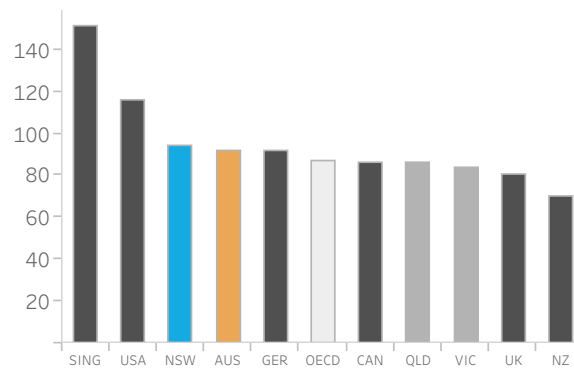
Change in annual growth of net business creation (business entry rates – exit rates) between 2014 and 2018



Source: ABS 8165.0 (Jun 2014 - Jun 2018)

LABOUR PRODUCTIVITY

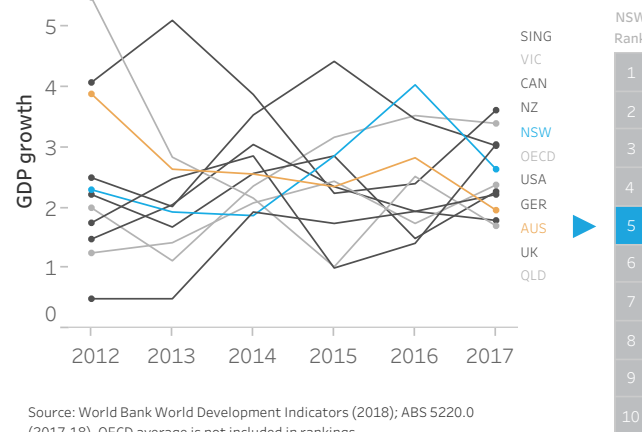
GDP (2011 USD) per person employed, 2018



Source: World Bank World Development Indicators (2018); ABS 5220.0 (2017-18), 6202.0 (Dec 2018). OECD average is not included in rankings.

ANNUAL GDP GROWTH

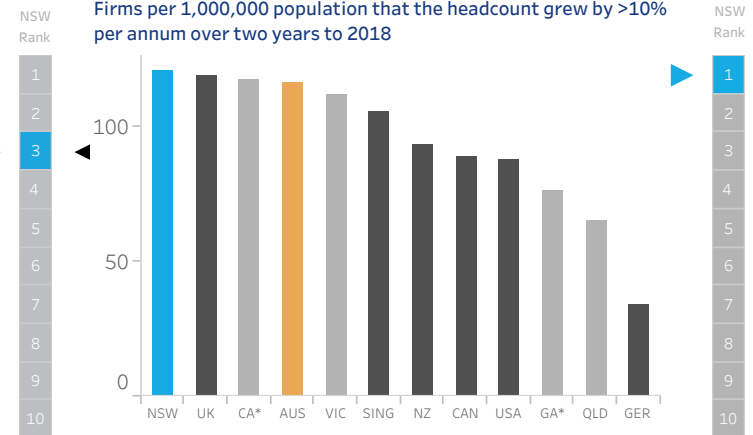
Annual percentage growth in GDP



Source: World Bank World Development Indicators (2018); ABS 5220.0 (2017-18). OECD average is not included in rankings

GROWTH FIRMS

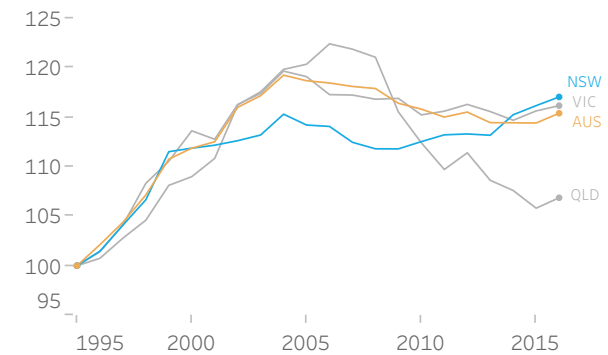
Firms per 1,000,000 population that the headcount grew by >10% per annum over two years to 2018



Source: CSIRO Data61 Ribit.net analysis of LinkedIn data (2018); OCED MSTI (2018); ABS 3101.0 (Mar 2018); US Census Bureau (2010-2018) Time series data has not been calculated. *The US State of California and Georgia

MULTI-FACTOR PRODUCTIVITY INDEX

Multi-factor productivity for the market sector indexed to 1995



Source: NSW Centre for Economic and Regional Development (Oct 2017).

Energy Productivity

Businesses that use energy efficiently can reduce their running costs and environmental impact and increase competitiveness.

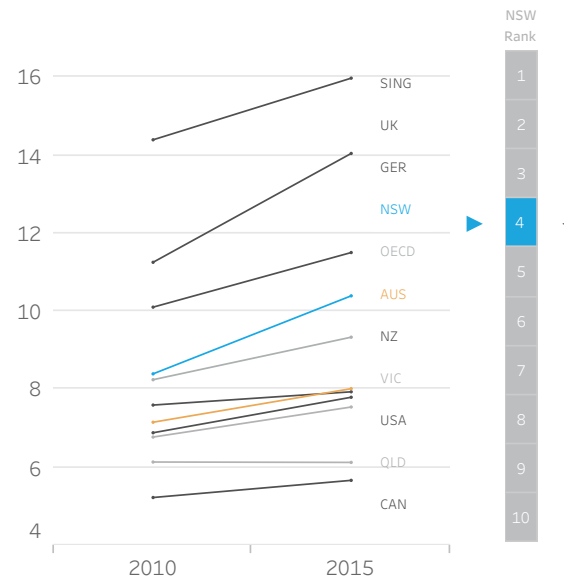
NSW ranks 4th for energy productivity, behind Singapore, the UK and Germany.

When making comparisons between jurisdictions, it is important to recognise that energy productivity is affected by economic composition. For this reason, it is useful to consider a jurisdiction's improvement in energy productivity over time. Since 2005, NSW has made steady improvements in energy productivity, with the UK and Singapore making the most significant improvements.

NSW outperforms all Australian benchmarks for both energy productivity and energy productivity improvement.

ENERGY PRODUCTIVITY

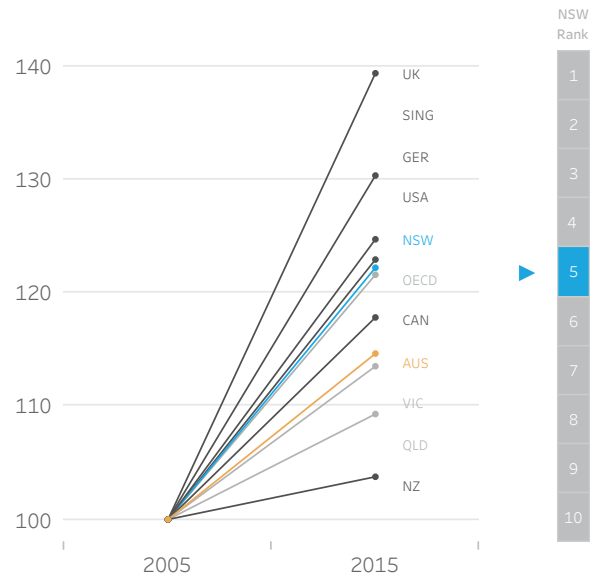
Energy productivity (2011 USD GDP/kg oil equivalent), 2015



Source: World Bank World Development Indicators (2018); Office of the Chief Economist Australian Energy Statistics (2017), ABS 5220.0 (2017-18). OECD average is not included in rankings.

ENERGY PRODUCTIVITY IMPROVEMENT

Energy productivity indexed to 2005, 2005-2015



Source: World Bank World Development Indicators (2018); Office of the Chief Economist Australian Energy Statistics (2017), ABS 5220.0 (2017-18). OECD average is not included in rankings.



For every dollar of GDP in 2016, NSW USED 2.7 MEGAJOULES OF ENERGY

Endnotes

1. World Bank (2019) - International Comparison Program database - see <https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD?locations=AU-CA-DE-SG-GB-US-NZ>
2. ABS (Nov 2018) - Year ending June estimates from ABS (Nov 2018) 5220.0 - Australian National Accounts: State Accounts, 2017-18 - Table 1. Converted using outcomes for Australia.
3. US Bureau of Economic Analysis (2019) - see <https://apps.bea.gov/itable/itable.cfm?ReqID=70&step=1#reqid=70&step=1&isuri=1>
4. OECD Glossary of Statistical Terms: 'Research and development expenditure' <https://stats.oecd.org/glossary/detail.asp?ID=2315>
5. League of Scholars (Jan 2019) CSIRO Data 61 analysis
6. Department of Education and Training (Cth) (2016) Inquiry into Australia's Future in Research and Innovation: Submission from the Department of Education and Training to the Joint Select Committee on Trade and Investment Growth
7. IP Australia 2019.
8. El Ansari, Y, CEO, Australian Private Equity and Venture Capital Association Limited (2017), Feature Article: Australia's venture capital and private equity market in Australian Innovation System Report 2017
9. NSW Government (2019) Sydney Startup Hub: One Year report
10. Startup Genome (2019) Global Startup Ecosystem Report
11. OECD Data (2019) 'Multifactor productivity' <https://data.oecd.org/lprdy/multifactor-productivity.htm>
12. Productivity Commission (2008), Enhancing Australia's productivity growth

All data in this scorecard is the latest available for all jurisdictions as at 31 March 2019.

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LinkedIn data coverage

Scorecard Year

○ 2018

● 2019

In NSW, LinkedIn data covers an estimated 99% of large businesses employing over 200 people, and more than 95% of all businesses employing 10 or more people.

The estimated coverage by sector is:

Sector	COVERAGE
Professional, Scientific and Technic..	100%
Financial and Insurance Services	84%
Mining	83%
Information Media and Telecommu..	69%
Education and Training	60%
Arts and Recreation Services	57%
Public Administration and Safety	56%
Other Services	55%
Construction	39%
Rental, Hiring and Real Estate Serv..	34%
Health Care and Social Assistance	31%
Administrative and Support Servic..	29%
Wholesale Trade	28%
Electricity, Gas, Water and Waste ..	22%
Retail Trade	21%
Transport, Postal and Warehousing	21%
Manufacturing	15%
Accommodation and Food Services	8%
Agriculture, Forestry and Fishing	4%

The lower penetration of LinkedIn in sectors such as construction, retail, finance and insurance reflects the large number of individual contractors, sole traders, owner-operators, family trusts and other accounting entities in these sectors.

Source: CSIRO's Data61 May 2019.

Based on estimates derived from ABS 8165.0 Counts of Australian Businesses, including Entries and Exits 2018 & LinkedIn Australian business counts by Industry 2019. Values show relative coverage of Australian businesses on LinkedIn by industry.